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A summary of these results may be of interest:

Date	Hydrogen Lines		Narrow Bright Lines
	Character	Displacement	Displacement
1919, December 12	Narrow	+ 51 <sup>km</sup>	+ 50 <sup>km</sup>
1920, January 15	Broad, diffuse	+ 140	+ 55
January 29	Broad, diffuse	+ 150	+ 56
February 6	Broad, diffuse	+ 160	+ 53

The displacements of the broad hydrogen lines are given in terms of velocity, but it seems more probable that they are due to some cause other than the Doppler effect. The helium line is difficult of measurement, but its displacement seems to be intermediate between that of the hydrogen and the narrow bright lines.

The character of the hydrogen lines and  $\lambda 4472$ , and the relative intensities of the former, suggest a source of radiation quite different from that which produced the narrow hydrogen lines seen previously. It is as tho a fresh radiative pulse had occurred in the comparatively dense gas present in the lower layers of the star's atmosphere, thus producing broad lines which, like many of the iron lines investigated in the laboratory, might show a marked widening toward the red.

Especial interest will attach to the observations of the behavior of these lines thruout the star's minimum of light, which will be made as soon as the period admits of work at this phase. At present the conjunction with the Sun occurs during minimum light. The possibility of similar phenomena in the spectra of other stars of type Md near minimum of light is also a matter of much interest.

W. S. ADAMS.  
A. H. JOY.

#### PHOTOMETRIC TESTS OF ADAMS AND JOY'S LIST OF STARS WITH SPECTRA SIMILAR TO THE CEPHEID VARIABLES

In the autumn of 1917 Mr. W. S. Adams kindly forwarded to me a list of stars which because of their spectra might be variables of the Cepheid type. This list was afterwards extended and described by Adams and Joy<sup>1</sup> at the Pasadena meeting of the Astronomical Society of the Pacific. The stars were placed on our observing

<sup>1</sup>*Publications A. S. P.*, **31**, 184, 1919.

list for the photo-electric photometer, and while a few measures were made in 1918-1919, it was only during the past few months that opportunity was had to make a test of most of the objects. Each star was compared with one or more comparison stars of nearly the same spectral class, and the measures were usually extended over an interval of three weeks or more. In the table the results are shown by the average deviation of an observation for each star. An observation comprises all the measures taken on one night, usually three sets of four readings each on the suspected variable and comparison stars.

Boss Number	Star	Harvard Magnitude	Mt. Wilson Spectrum	Average Deviation Magnitude	Number of Observations	Comparison Stars	Remarks
619	14 Persei	5.58	F9	$\pm 0.018$	3	1	Variable Too far south
772	$\alpha$ Persei	1.90	F5	.006	3	2	
1074	58 Persei	4.46	G1	.017	8	1	
1606	$\psi^1$ Aurigae	5.10	K3	.066	7	2	
1839	$\delta$ Canis Majoris	1.98	G1	....	..	..	
2065	$\xi$ Puppis	3.47	G6	....	..	..	
2153	$\rho$ Puppis	2.88	F6	....	..	..	
4443	$\beta$ Draconis	2.99	G1	.014	3	1	
4707	45 Draconis	4.95	F8	.009	4	1	
5187	31 $\sigma^2$ Cygni	3.95	G7	.012	6	2	
5197	$\alpha^1$ Capricorni	4.55	G1	.006	3	1	
5229	$\gamma$ Cygni	2.32	F9	.013	5	1	
5255	41 Cygni	4.09	F6	.008	4	1	
5431	$\xi$ Cygni	3.92	K4	.020	3	1	
5676	$\alpha$ Aquarii	3.19	G0	.016	3	1	
5804	5 Lacertae	4.61	K2	.022	3	2	Irregular variable, Guthnick A.N., 199, 177, 1914.
5931	.....	5.48	G0	.008	3	1	
6135	$\rho$ Cassiopeiae	4.85	G5	....	..	..	

It will be seen that only one new variable,  $\psi^1$  Aurigae, has been detected. This star has shown a range of more than 0.2 magnitude, but if it has a regular period this can not be less than three months. Probably it is more or less irregular, possibly like the other variable on the list,  $\rho$  Cassiopeiae. It may be noted that  $\psi^1$  Aurigae was the very last star to be tested, and it was not until this, the fourteenth object, was observed that any evidence of real variation was found.

From the residuals for the remaining stars there is found a probable error of one observation equal to  $\pm 0.013$  magnitude, or

for the mean of three observations,  $\pm 0.008$  magnitude. While this is a greater discordance than would ordinarily occur in this work, it indicates that the stars as a class are fairly constant. In fact, only two or three stars show a measured range as great as 0.06 magnitude, and the others still less. Unless a period is known as in the case of a spectroscopic binary, there is at present no apparent advantage in attempting to follow changes of less than a tenth of a magnitude in irregular or long periods.

Of course it may happen that several other stars of the list are variables which have been missed, and further observations will be made here on suspicious cases. In particular, the three stars which were measured at intervals of a year, 58 *Persei*, 31 *Cygni* and  $\gamma$  *Cygni*, each show a progressive change of 0.02 magnitude during that time, and while no significance is given to this, it may be worth while to follow the stars casually for some time to come.

JOEL STEBBINS.

University of Illinois Observatory,  
March, 1920.

#### THE SPECTRUM OF NOVA LYRAE

The discovery, by Miss Mackie, of a new star in the constellation *Lyra*, was announced in *Harvard College Observatory Bulletin* No. 705. Observations of its spectrum have been secured at the Lick Observatory on the following dates: 1920, February 12, 13, 17, March 4 and 18. They include the region of the spectrum from the ultra-violet to the red at H $\alpha$ . There seem to be no emission bands of appreciable strength of shorter wave-length than the limit of the hydrogen series, tho the extreme rays are obliterated by atmospheric absorption at the low altitude at which it was necessary to observe the star in the morning sky.

The principal emission bands are those of hydrogen, the usual compound band near 4650A, a band overlying H $\delta$ , which has occurred in many novae, and others in positions 3995, N<sub>2</sub>, N<sub>1</sub>, 5681, 5752 and 6474A. There are a number of fainter bands whose positions will be given in a more detailed account of the spectrum to appear later. The band 5752 doubtless corresponds with the nebular line 5755A; it was measured on one of the earlier plates, and on all of these N<sub>1</sub>\* suffers a similar displacement toward the

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\*N<sub>2</sub> is too faint to record on the early plates.